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# Survey: Materials Life Cycle Research and Development in the Federal Government Fiscal year 1980

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U.S. DEPARTMENT OF COMMERCE  
National Bureau of Standards  
National Measurement Laboratory  
Washington, DC 20234

September 1981

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For the Committee on  
Materials, (COMAT)



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**SURVEY:  
MATERIALS LIFE CYCLE RESEARCH AND  
DEVELOPMENT IN THE FEDERAL  
GOVERNMENT FISCAL YEAR 1980**

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by COMAT Working Group  
John B. Wachtman, Jr., Leader

U.S. DEPARTMENT OF COMMERCE  
National Bureau of Standards  
National Measurement Laboratory  
Washington, DC 20234

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Materials, (COMAT)



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**U.S. DEPARTMENT OF COMMERCE, Malcolm Baldrige, *Secretary***  
**NATIONAL BUREAU OF STANDARDS, Ernest Ambler, *Director***



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in the Federal Government  
Fiscal Year 1980

John B. Wachtman, Jr.  
Director, Center for Materials Science  
National Bureau of Standards

Leader, COMAT Working Group for Survey  
of Federal Materials Research and Development  
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For the Committee on Materials, (COMAT)

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Dr. Edward A. Frieman, ER-1  
Director, Office of Energy Research  
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Dr. Louis C. Ianniello, ER-131  
Chief, Metallurgy and Ceramics Branch  
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Dear [Name]:  
I am pleased to inform you that your application for admission to the [Program] has been accepted. We are excited to have you join our community of students and faculty. Please contact the Office of Admissions at [Phone Number] for more information and to complete the enrollment process.

COMAT Survey of Materials Life Cycle R & D  
in the Federal Government; Fiscal Year 1980

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## Acronyms and Abbreviations

DOC - Department of Commerce  
DOD - Department of Defense  
DOE - Department of Energy  
DOI - Department of the Interior  
DOL - Department of Labor  
DOS - Department of State  
DOT - Department of Transportation  
EPA - Environmental Protection Agency  
FEMA - Federal Emergency Management Agency  
GSA - General Services Administration  
HHS - Department of Health and Human Services  
HUD - Department of Housing and Urban Development  
NASA - National Aeronautics and Space Administration  
NRC - Nuclear Regulatory Commission  
NSF - National Science Foundation  
Smithsonian - The Smithsonian Institute  
Treasury - Department of the Treasury  
TVA - Tennessee Valley Authority  
USDA - Department of Agriculture

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Development in Materials; Fiscal Year 1980

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COMAT Survey of Materials Life Cycle R & D in the  
Federal Government Fiscal Year 1980

Introduction

- The Survey of Materials Life Cycle R & D in the Federal Government - Fiscal Year 1980 was undertaken by COMAT in response to Congressional expressions of interest that the 1976 Inventory of Federal Materials R & D\* be updated.
- The survey was accomplished by distributing a questionnaire to COMAT member agency representatives and to five other Federal agencies which participated in the 1976 Inventory.
- The 1980 survey questionnaire was designed to update the 1976 Inventory data and to develop new information as follows:
  - Data on funding distributions by nature of research (basic, applied, developmental).
  - Data on funding distributions by two additional "National Goals" ("End Uses" see Tables 2 and 2a). These were "Productivity" and "Critical and Strategic Materials".
  - Data on funding of research on individual critical and strategic materials by technological goal and also by stage in the materials cycle.
- The definition of materials used in the 1976 Inventory was used for the 1980 Survey. Funding data was requested for both direct and related impacts on major distribution categories.
- In the 1980 Survey, funds were attributable to more than one goal within the following distributions: end use, stage of cycle, class of materials, and critical material technology goal.

\*Phase I Report: Inventory and Analysis of Materials Life Cycle Research and Development in the Federal Government - Fiscal Year 1976; by COMAT Task Force I, Thomas V. Falkie, Chairman.

A limited number of copies are available from  
Dr. John B. Wachtman, Jr., Director, Center for  
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Washington, D.C. 20234.

COMAT Survey of Materials Life Cycle R & D in the  
Federal Government Fiscal Year 1980

Key Findings

- Total Federal R & D funding for materials R & D in FY 1980 was \$1,103,683K vs. \$961,320K in FY 1976.
- 72% of total funding was provided by 3 agencies: DOE, DOD, and DOI.
- Comparable amounts were reported for basic research, applied research, and development: \$326,156K; \$413,386K; and \$357,571K, respectively.
- 37% of the 1980 Federal materials R & D funding was directed to improved energy supplies; 26% to national security; 19% to improve the science and technology base and 6% to improve industrial productivity.
- In terms of stages of the materials cycle, the largest expenditures (25%) was directed to applications and utilization of materials.
- 23% of the 1980 Federal materials R & D was performed within the funding agencies and an additional 30% in non civil-service Federal laboratories; 42% was performed by the private sector: 23% by industry, 19% by universities.
- \$66,762K of the 1980 Federal R & D in materials was related to technologies for reducing U.S. dependence on critical and strategic materials (Table 2).
- Critical materials research was reported for fourteen elements with the largest expenditures on developing substitution and life extension technologies for chromium containing alloys. Substantial efforts were reported for aluminum, titanium, nickel, and cobalt (Table 6).

Table 1. Distribution of Materials R & D Funding by Agency  
(\$1,000)

Funding Agency	1980 Funds	% of Total, 1980	1976 Funds
DOE	514,100	46.6	332,897 <sup>1</sup>
DOD	160,200	14.5	131,881
DOI	119,686	10.8	165,350*
NSF	88,920	8.1	68,700
NASA	78,582	7.1	51,533
USDA	64,598	5.9	38,254
DOC	35,795	3.2	21,080
NRC	13,674	1.2	7,028
TVA	9,650	0.87	9,226
HHS	6,070	0.55	16,625 <sup>2</sup>
DOT	3,442	0.31	6,153
DOL	3,000	0.28	---
TREASURY	2,516	0.23	790
EPA	2,400	0.22	99,399
SMITHSONIAN	1,000	0.009	1,000
FEMA	50	0.005	---
HUD	---	---	6,669
DOS	---	---	540
GSA	---	---	132
TOTALS	1,103,683	100.0	961,320

<sup>1</sup> Energy Research and Development Administration

<sup>2</sup> Department of Health, Education and Welfare

\*The decrease in DOI materials R & D funding from 1976 to 1980 reflects the transfer in 1977 of energy materials program elements from DOI to DOE.

Table 1a. Distribution of 1980 Materials R & D Funding by Nature of Work  
(\$1,000)

	Basic Research	Applied Research	Development	Total
DOE	113,200	110,700	290,200	514,100
DOD	44,000	97,900	18,300	160,200
DOI	24,492	79,337	15,857	119,686
NSF	83,980	4,940	---	88,920
NASA	22,910	49,030	6,642	78,582
USDA	23,994	34,459	6,145	64,598
DOC	4,321	19,485	11,989	35,795
NRC	---	13,674	---	13,674
TVA	1,948	5,154	2,548	9,650
HHS	5,751	319	---	6,070
DOT	200	3,153	89	3,442
DOL	---	---	3,000	3,000
TREASURY	310	1,435	771	2,516
EPA	---	400	2,000	2,400
SMITHSONIAN	1,000	---	---	1,000
FEMA	50	---	---	50
TOTALS	326,156	413,386	357,571	1,103,683

Table 2. Distribution of Funding by End Use\*\*  
(\$1000)

	National Security	Adequacy Supplies	Critical & Strategic Materials	Energy	Prod.	Standard Living	Environment	Transportation	Communication	S & T
*OOE	109,800	900	29,200	368,800	1,400	---	60,700	13,100	---	85,700
DOO	160,200 ---	---	---	---	---	---	---	---	---	---
		14,800	10,500	10,000	12,500	5,000	3,000	15,000	6,000	93,400
OOI	13,091 7,850	38,231 880	13,382 6,877	21,599 ---	12,355 2,177	298 ---	13,739 10,836	---	2,437 ---	---
NSF	---	2,940 4,440	230 1,600	200 33,400	150 3,000	---	165 4,970	---	---	81,350 100
NASA	500 60,282	1,016 832	200 ---	670 400	7,000 3,796	---	---	41,160 8,438	4,000 1,352	24,036 ---
*USOA	---	26,102	---	2,226	28,521	1,667	2,905	---	---	3,281
OOC	930 6,634	2,620 520	1,312 3,520	2,939 4,020	15,495 2,920	2,810 818	2,275 2,215	10,976 1,500	500 450	11,448 3,316
*NRC	---	---	---	13,674	---	---	---	---	---	---
*TVA	---	1,848	---	---	---	2,778	5,024	---	---	---
HHS	---	---	---	---	---	6,070	---	---	---	---
	---	---	---	---	---	---	---	---	---	5,750
DOT	---	---	---	745 ---	---	623 ---	---	2,074 1,115	---	---
*OOL	---	---	---	---	---	3,000	---	---	---	---
*TREASURY	182	467	---	---	317	1,550	---	---	---	---
EPA	---	---	---	---	---	---	2,400	---	---	---
SMITHSONIAN	---	---	---	---	---	---	---	---	---	1,000
FEMA	---	---	50 ---	---	---	---	---	---	---	---
	50	50	---	---	---	---	---	---	---	---
Direct:	284,703	74,124	44,374	410,853	65,238	18,796	84,808	67,310	6,937	206,815
Related:	126,416	21,522	22,497	47,820	24,672	10,888	23,421	29,393	9,302	102,566

+Upper amounts "direct"  
Lower amounts "related"

\*All amounts reported "direct"

\*\*The survey allowed attribution of funds to more than one end use; therefore agency totals may differ slightly from the funding totals reported in Table 1.

Table 2a. Distribution of R & D Funding by End Use:  
 Comparison of 1980 & 1976 Totals  
 (\$1000)

End Use	1980 Total	% of 1980 Total*	1976 Total	% of 1976 Total
National Security	284,703 (126,416)	25.8	190,872 ---	19.8
Adequacy of Supplies	73,424 (21,522)	6.6	94,917 ---	9.87
Critical & Strategic Materials	44,374 (22,497)	4.0	--- ---	---
Energy	410,853 (47,820)	37.2	320,922 ---	33.4
Productivity	65,238 (24,672)	5.9	--- ---	---
Standard of Living	18,796 (10,888)	1.7	101,759 ---	10.6
Environment	84,808 (23,421)	7.7	129,420 ---	13.5
Transportation	68,116 (29,393)	6.2	21,151 ---	2.20
Communication	6,937 (9,302)	0.6	2,798 ---	0.29
Science & Technology	206,915 (102,566)	18.7	99,799 ---	10.38

\*Funds were attributable to more than one goal within this distribution.

Table 3. Distribution of R & D Funding by Stage of the Materials Cycle<sup>†</sup>  
(\$1000)

	Exploration of Resources	Extraction of Raw Materials	Processing of Raw Materials	Manuf. and Fabrication	Application and Utilization	Evaluation of Properties	Develop- ment of New Materials	Waste Management
*DOE	1,300	900	5,700	85,700	187,200	108,300	44,800	59,400
DOD	---	---	2,000	12,000	35,000	21,600	87,000	500
	---	---	---	---	12,000	25,800	15,000	3,500
DOI	62,570	15,060	925	8,656	1,575	7,715	7,307	313
	5,700	903	8,740	---	89	---	---	9,232
NSF	630	1,880	1,670	1,260	30	74,070	85	40
	200	760	2,760	1,500	4,580	120	860	1,760
NASA	2,464	---	150	23,274	19,660	16,747	16,257	30
	---	---	---	2,750	33,155	100	320	80
*USDA	27,607	3,067	5,550	10,625	4,778	7,310	5,177	2,686
DOC	47	541	1,450	11,290	12,160	12,988	1,440	247
	130	206	524	3,502	1,923	6,880	1,700	1,184
*NRC	---	---	---	---	8,474	4,940	---	746
*TVA	---	1,848	---	---	2,548	---	100	5,154
HHS	---	---	---	32	28	5,060	39	---
	---	---	---	---	5,060	69	---	---
DOT	---	---	---	55	1,050	1,087	495	250
	---	---	---	---	244	335	---	---
*DOL	---	---	---	---	---	---	3,000	---
*TREASURY	---	---	---	752	1,447	103	214	---
EPA	---	---	---	---	---	---	---	---
	---	300	300	300	700	300	---	500
*SMITHSONIAN	---	---	---	---	---	1,000	---	---
FEMA	---	---	---	---	---	---	---	---
	---	---	---	---	---	---	---	---
Direct:	94,618	23,296	17,445	153,644	273,950	260,920	165,914	69,366
Related:	6,030	2,169	12,324	8,052	57,751	3,604	17,880	16,256

†Upper amounts "direct"  
Lower amounts "related"

\*All amounts reported "direct"

Table 3a. Distribution of R & D Funding by Stage of the Materials Cycle:  
Comparison of 1980 & 1976 Totals

Stage of Materials Cycle	1980 Funding*	% of 1980 Total**	1976 Funding	% of 1976 Total
Exploration of Resources	94,618 (6,030)	8.6	59,948 ---	7.0
Extraction of Raw Materials	23,296 (2,169)	2.1	89,083 ---	10.5
Processing of Raw Materials	17,445 (12,324)	1.6	60,947 ---	7.1
Manufacture and Fabrication	153,644 (8,052)	13.9	16,244 ---	1.9
Application and Utilization	273,950 (57,751)	24.8	187,583 ---	22.1
Evaluation of Properties	260,920 (3,604)	23.6	219,488 ---	25.8
Development of Raw Materials	165,914 (17,880)	15.0	122,778 ---	14.5
Waste Management	69,366 (16,256)	6.3	93,873 ---	11.1
Unspecified	---		111,825	

\*Upper figures "direct"  
Lower figures "related"

\*\*Funds were attributable to more than one goal within this distribution.

Table 4. Distribution of Materials R & D Funding by Performer  
(\$1000)

	Universities	Industry	Within Agency	Other Fed. Labs	Non-Civil Service Nat'l Labs	Non-Profit Labs
DOE	61,800	113,600	1,000	8,400	318,600	7,600
DOD	30,500	80,900	34,100	3,300	3,300	16,800
DOI	7,759	8,694	91,829	925	300	279
NSF	86,450	1,600	---	---	550	320
NASA	7,767	37,071	30,610	915	1,810	409
USDA	5,905	---	58,959	---	---	---
DOC	1,360	11,599	20,991	890	150	818
NRC	370	195	1,410	11,104	---	595
TVA	---	---	9,650	---	---	---
HHS	4,880	46	---	13	---	60
DOT	197	1,335	160	238	804	708
DOL	---	3,000	---	---	---	---
TREASURY	100	---	612	354	---	1,450
EPA	300	1,300	200	300	---	300
SMITHSONIAN	---	---	1,000	---	---	---
FEMA	---	---	---	50	---	---
TOTALS	207,388	259,340	250,521	26,489	325,514	29,339

Table 4a. Distribution of Materials R & D Funding by Performer:  
 Comparison of 1980 & 1976 Totals  
 (\$1000)

Performer	1980 Funds	% of 1980 Total*	1976 Funds	% of 1976 Total
Universities	207,388	18.8	125,519	16.5
Industry	259,340	23.5	124,520 <sup>1</sup>	16.4
Within Agency	250,521	22.7	245,548 <sup>2</sup>	32.2
Other Federal Labs	26,489	2.4	---	---
Non Civil-Service National Labs	325,514	29.5	232,858	30.6
Non-Profit Labs	29,339	2.7	26,620	3.5
Unspecified	---	---	200,275	---

\*Funds were attributable to more than one goal within this distribution.

<sup>1</sup>"Private"

<sup>2</sup>"Federal Government"

Table 5. Distribution of R & O Funding by Class of Materials  
(\$1000)

	Metals and Alloys	Ceramics and Glass	Elect. Materials	Geologic	Polymers Plastics	Composites	Fuel	Nonfood Agric. & Animal
*DOE	186,400	77,700	58,500	42,400	24,500	20,800	55,600	100
000	62,700 3,700	14,200 2,500	26,300 3,500	--- 500	20,700 1,500	25,600 7,500	700 1,000	--- ---
001	23,193 8,335	800 ---	--- ---	30,589 13,472	3,300 ---	--- 90	31,288 578	--- ---
NSF	15,730 6,160	4,290 1,300	14,530 10,040	6,760 ---	9,080 2,050	1,210 500	500 1,880	1,600 ---
NASA	20,270 1,270	11,862 2,050	9,322 1,270	1,958 ---	7,214 1,200	27,180 ---	270 300	506 200
*USOA	---	---	---	---	147	920	554	57,632
00C	17,366 1,720	2,398 350	2,501 520	765 675	4,469 ---	485 400	3,720 2,000	570 200
NRC	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
*TVA	---	---	---	1,848	---	5,254	2,548	---
*HHS	---	---	---	---	6,070	---	---	---
00T	579 250	--- ---	--- ---	30 610	235 200	20 745	--- ---	--- ---
DOL	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
*TREASURY	300	---	---	---	1,000	550	---	---
EPA	--- 400	--- 100	--- ---	--- 400	--- 200	--- 300	--- ---	--- ---
SMITHSONIAN	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
FEMA	50 ---	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
DIRECT:	326,588	111,250	111,153	84,350	76,715	82,019	95,180	60,808
RELATED:	21,835	6,300	15,330	15,657	9,535	9,535	5,758	400

+Upper amounts "direct"  
Lower amounts "related"

\*All amounts reported "direct"

Table 6. Distribution of R & D Funding for Critical Materials by Materials and by Technology Goal\* (\$1000)

Technology Element	Substitution	New Sources	Reclamation	Life Extension	Conservation	Total direct	Total related	Total	Agency <sup>†</sup>
Chromium	4,546 1,060	961 1,020	260 270	20,270 1,300	540 200	26,577 ---	--- 3,850	30,427	1, 3, 4
Aluminum	--- 8,000	1,676 ---	--- ---	800 ---	--- ---	2,476 ---	--- 8,000	10,476	1, 2, 3
Titanium	850 3,600	301 ---	--- 210	2,370 ---	--- 500	3,521 ---	--- 4,310	7,831	1, 2, 3, 4
Nickel	807 500	1,662 549	150 470	1,100 1,530	325 700	4,044 ---	--- 3,749	7,793	1, 4
Cobalt	670 300	2,216 520	150 200	770 230	--- ---	3,806 ---	--- 1,250	5,056	1, 3, 4, 5
Niobium	2,000 ---	212 ---	--- 70	1,400 ---	--- 500	3,612 ---	--- 570	4,182	1, 3, 4
Platinum	700 ---	537 ---	--- 150	200 ---	380 ---	1,817 ---	--- 150	1,967	1, 3
Manganese	--- 400	1,059 204	--- ---	--- ---	--- ---	1,059 ---	--- 604	1,663	3, 4
Tantalum	--- ---	--- ---	--- ---	1,100 ---	--- 500	1,100 ---	--- 500	1,600	4
Tungsten	--- ---	527 230	--- 200	--- ---	340 ---	867 ---	--- 430	1,297	3
Iron Ore	--- ---	840 ---	--- 280	--- ---	--- ---	840 ---	--- 280	1,120	3
Beryllium	75 100	--- ---	--- ---	--- ---	--- ---	75 ---	--- 100	175	2
Gold	--- ---	142 ---	--- ---	--- ---	--- ---	142 ---	--- ---	142	3
Vanadium	--- ---	125 ---	--- ---	--- ---	--- ---	125 ---	--- ---	125	3
Direct	9,648	10,258	560	28,010	1,585	50,061	---	73,854	
Related	13,960	2,523	1,850	3,060	2,400	---	23,793		
Totals	23,608	12,781	2,410	31,070	3,985				

\*Upper amounts "direct"  
Lower amounts "related"

- <sup>†</sup> 1. Department of Energy  
2. Department of Defense  
3. Department of the Interior  
4. Department of Commerce  
5. National Aeronautics and Space Administration

Table 7. Distribution of Critical Materials R & O Funding by Stage of the Materials Cycle\*  
(\$1000)

	Exploration of Resources	Extraction	Processing Raw Materials	Manufacture and Fabrication	Application and Utilization	Evaluation of Properties	Development of Materials	Waste Management	Totals
Chromium	151 ---	---	550 ---	10,300 420	60,050 100	15,570 ---	31,616 300	260 70	118,497 890
Aluminum	121 ---	---	1,555 ---	1,000 ---	3,000 ---	5,000 ---	500 ---	---	11,176 ---
Niobium	32 ---	---	180 ---	2,000 200	3,000 200	1,000 500	4,000 ---	---	10,212 970
Cobalt	120 30	306 106	825 381	810 420	1,000 113	1,190 100	1,270 530	397 84	5,918 1,764
Titanium	51 ---	---	250 210	300 200	1,000 200	1,000 500	1,050 300	---	3,651 1,410
Platinum	38 ---	---	500 ---	200 ---	500 ---	1,000 ---	680 ---	---	2,918 150
Manganese	55 30	251 106	50 124	500 ---	600 113	1,000 ---	300 ---	247 288	3,003 661
Nickel	120 30	251 243	660 324	---	---	500 500	860 230	397 293	2,788 2,133
Lead	92 ---	---	950 ---	---	---	---	---	265 ---	1,307 ---
Tantalum	---	---	---	100 200	200 200	500 500	200 ---	---	1,000 900
Iron Ore	---	---	840 ---	---	---	---	---	---	840 280
Tungsten	57 ---	---	470 430	---	---	---	125 ---	---	652 430
Direct	837	808	6,830	15,210	69,350	26,760	40,601	1,566	161,962
Related	90	455	1,469	1,640	1,239	2,100	1,360	1,235	9,588

\*Upper amounts "direct"  
Lower amounts "related"

## COMAT Representatives

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### Executive Secretary, COMAT

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---

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Department of Transportation

\*COMAT representatives as of January 1981; individuals indicated have left office and new representatives had not yet been named at the time this report was prepared.

COMAT SURVEY OF LIFE CYCLE MATERIALS R & D  
in the FEDERAL GOVERNMENT, FISCAL YEAR 1980

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- Division of Chemical and Process Engineering
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  - Bureau of Printing and Engineering
  - Bureau of the Mint

1980 COMAT Survey

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Questionnaire and Definitions

COMAT Survey of Materials Research and Development  
in the Federal Government--Fiscal Year 1980

Part A--Overall Agency Materials R&D Program

A-1. Please provide a statement of agency mission as it relates to Materials R&D. (Use additional pages if necessary). \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

A-2. Person to contact for overall agency Materials R&D Program:

Name: \_\_\_\_\_

Mailing Address: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Telephone Number: \_\_\_\_\_

A-3. Agency's total Materials R&D Funding in FY80: \$ \_\_\_\_\_

A-4. Classification of the agency's total Materials Program by nature of work. (Note that item A-4 can be completed by adding the corresponding answers given for primary program components. See attached notes for definitions of terms.)

FY81 Agency funding for:

(a) basic research \_\_\_\_\_

(b) applied research \_\_\_\_\_

(c) development \_\_\_\_\_

Total (should agree with A-3). \_\_\_\_\_

A-5.\*Classification of the agency's total Materials Program by end use.

FY80 Agency funding for:

	Direct†	Related†
(a) national security	_____	_____
(b) adequacy of materials supplies	_____	_____
(c) critical and strategic materials	_____	_____
(d) energy	_____	_____
(e) productivity	_____	_____
(f) standard of living	_____	_____
(g) environment	_____	_____
(h) transportation	_____	_____
(i) communication	_____	_____
(j) science and technology	_____	_____

A-6.\*Classification of the agency's total Materials Program by stage of the materials cycle.

FY80 Agency funding for:

	Direct†	Related†
(a) exploration of resources	_____	_____
(b) extraction of raw materials	_____	_____
(c) processing of raw materials	_____	_____
(d) manufacture and fabrication	_____	_____
(e) application and utilization	_____	_____
(f) evaluation of properties	_____	_____
(g) development of materials	_____	_____
(h) waste management	_____	_____

A-7.\*Classification of the agency's total Materials Program by performer.

FY80 agency's Materials Program performed:

(a) in universities	_____
(b) in industry	_____
(c) within agency	_____
(d) in other Federal laboratories	_____
(e) in non-civil service national laboratories.	_____
(f) in not-for-profit laboratories	_____

A-8.\*Classification of the agency's total Materials Program by class of material.

	Direct†	Related†
(a) Metals and alloys	_____	_____
(b) Ceramics and glass	_____	_____
(c) Electronic materials	_____	_____
(d) Geologic materials	_____	_____
(e) Polymers, plastics, elastomers	_____	_____
(f) Composites	_____	_____
(g) Fuel materials	_____	_____
(h) Nonfood agricultural and animal products	_____	_____

Answers are requested for A-9 and A-10 below for each critical and strategic material (see definition) under investigation in agency's programs; use additional sheets as needed.

A-9.\*Classification of the agency's research funding for specific critical and strategic materials by stages in the materials cycle:

CRITICAL OR STRATEGIC MATERIAL	_____	
	Direct†	Related†
(a) exploration of resources	_____	_____
(b) extraction of raw materials	_____	_____
(c) processing of raw materials	_____	_____
(d) manufacture and fabrication	_____	_____
(e) application and utilization	_____	_____
(f) evaluation of properties	_____	_____
(g) development of materials	_____	_____
(h) waste management	_____	_____

A-10\*Classification of the agency's research funding for specific critical and strategic materials by the following Technology goals (see definitions):

CRITICAL OR STRATEGIC MATERIAL \_\_\_\_\_

	Direct†	Related†
(a) Substitution Technology	_____	_____
(b) New Sources or New Production Technology	_____	_____
(c) Reclamation Technology	_____	_____
(d) Life Extension Technology	_____	_____
(e) Conservation Technology	_____	_____

A-11. Person to contact for detailed information on critical and strategic materials program.

Name: \_\_\_\_\_  
 Mailing Address: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 Telephone Number: \_\_\_\_\_

\*Note: funds may be attributed to more than one goal where appropriate. See attached notes for definition of terms.

†"Direct": Program funding for research whose impact is intended primarily for the indicated category.

"Related": Program funding for research primarily directed to one or more other categories, but with significant potential for impact in the indicated category.

For example, research directed primarily to improve performance of potential substitutes for critical materials [A-5(c)-Direct] may have significant impact on materials for national security [A-5(a)-Related].

## Definitions for the COMAT Survey of Federal Research and Development in Materials for Fiscal Year 1980

The following definitions are generally based upon the previous COMAT Inventories: Phase I Report, Inventory and Analysis of Materials Life Cycle Research and Development in the Federal Government Fiscal Year 1976, issued in April 1976. Phase II Report, Inventory and Analysis of Materials Life Cycle Research and Development in U.S. Industry 1977, issued in April 1979.

### Definition of Materials

Materials include any substance segregated, introduced or used by man in performance of functions. The COMAT inventory includes all aspects of R&D commitments to any of the stages in the life cycle of materials, ranging from the identification of natural resources to their final stage of recycle or final disposal. It is concerned with both renewable resources and nonrenewable resources, through their transition from raw materials into industrial and consumer materials, as well as to their consumption and use. Materials are accordingly defined to include such substances as raw minerals, metals, composites, ceramics, semiconductors, dielectrics, glasses, polymers, wood, fiber, leather, geologic materials and other nonfood agricultural and animal products, byproducts, scrap and wastes. R&D on processing coal, gas, oil, and nuclear fuel materials are included, but not on their use as fuels. In addition to the more commonly recognized materials of manufacture, "nonmanufactured" materials are included. Specifically excluded from this inventory are materials being used for food and drugs.

### Definition of Critical and Strategic Materials

Critical and Strategic Materials are defined here as (a) those which are primarily imported, for which there are prospects of shortages or uncertain supply, for which substitutes are not presently available) and (b) which will be needed in a National emergency to supply industrial, military and essential civilian needs; these include manganese, cobalt, chromium and platinum group metals, columbium, mica, titanium, tantalum, bauxite, asbestos, tin, nickel, cadmium, potassium, mercury, zinc, tungsten, and gold.

### Definition of Materials Research and Development

The Office of Management and Budget (Circular #A-11, June 3, 1980) defines research and development categories as follows:

Basic Research: Systematic, intensive study directed toward greater knowledge or understanding of the subject studied.

Applied Research: Systematic Study directed specifically toward applying new knowledge to meet a recognized need.

Development: Systematic application of knowledge toward the production of useful materials, devices and systems or methods; including design; development and improvement of prototypes and new processes to meet specific requirements.

Using this definition, materials R&D for the purposes of the COMAT inventory is not restricted to research on the structures and properties of materials, or the development of materials to meet the requirements for specialized engineering functions. It includes R&D directed toward any portion of the total materials life cycle, from exploration and mining through manufacture, to final disposal and recycling/reuse. Programs involving energy demands and environmental impacts associated with the various stages of the materials cycle also are included, as are programs directed toward assessing the economic impact of materials supply/availability.

On the other hand, specifically excluded from the inventory are studies involving routine data collection and compilation, routine failure analysis, regulatory or compliance-type testing and routine economic presentations of statistical data.

#### Definition of End Use Categories

[These categories with the exception of Critical Materials and Productivity are the same as those described in Appendix F-1 of the COMAT Phase I report (1976). Definitions below are based on the descriptions in that report.]

National Security--The programs directed toward development of materials for national defense.

Adequacy of Materials Supplies--Programs directed toward the development of, and conservation of materials and materials resources; and programs which are directed toward: exploration for resources other than fuel materials.

#### Critical and Strategic Materials

Programs directed toward assessment of needs for critical materials and toward development of improved understanding of processing, adaptability in engineering design, and performance of potential substitutes for critical materials.

Energy--Programs directed toward materials for energy generation, and conservation and towards nonfuel uses of fuel materials.

Productivity--Programs which are directed to improvements or innovations in materials processing or in the materials themselves, and which have potential for positive productivity impact either directly in the materials processing industries or in the materials using sectors of the economy.

Standard of Living--Programs directed toward materials research and development for health and safety, law enforcement, agriculture/general farming, environmental quality/agricultural impacts, ocean engineering/biological sciences and fertilizer.

Environment--Programs directed toward materials related to environmental protection, environmental quality, and ecological restoration.

Transportation--Programs directed to materials for transportation including construction/roads, highways, and bridges.

Communications--Programs directed toward materials research related to electrical and electronic ceramics, electronic materials, and semi-conductors.

Science and Technology--Programs directed toward development of knowledge and theory and/or education.

Definition of Technology Goals for Critical and Strategic Materials Research (Question A-10):

Substitution--Research directed to identification and development of materials and materials properties to replace functions now met primarily by use of critical materials.

New Sources or New Production--Research directed to obtaining critical materials from marginal or unconventional sources such as chromium from shale ash or manganese from ocean floor nodules.

Reclamation--Research directed to obtaining value from waste such as recovery of critical materials from processing operations (e.g., machining scrap), or from industrial waste stream (e.g., plating baths).

Life Extension--Research directed to extending service life of products containing critical materials such as design improvement, wear or corrosion control, or extension of fatigue life.

Conservation--Research directed to reduction of use of critical materials in design and processing such as coating technologies, net shape forming techniques, or reduction of edge scrap.

CHARTER OF COMMITTEE ON MATERIALS  
of the  
FEDERAL COORDINATING COUNCIL FOR SCIENCE,  
ENGINEERING, AND TECHNOLOGY

Establishment

Materials-related issues, ranging from the origin of non-renewable resources, through translation into materials for use to their disposal, constitute a set of critical problems that cut across many Departments and agencies of the Executive Branch. To ensure that the scientific and technological policies of the Executive Branch effectively address these issues, it is desirable to establish an interagency mechanism for the formulation of policy. Therefore, a Committee on Materials (COMAT) is hereby established by the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET). The Federal Coordinating Council for Science, Engineering, and Technology was established by 42 U.S.C. 6651. Under Reorganization Plan Number 1 of 1977, it has been established by the Executive Office of the President under the Chairmanship of the Director of the Office of Science and Technology Policy.

Purpose

The Committee on Materials shall identify key points of emphasis for Federal materials research, resource development, and utilization within the context of the total materials system in the economy. For the purposes of the Committee, materials shall be defined as all substances of which products are made or derived, except food, drugs, fuel, and agricultural products, such as wood and leather.

In fulfilling this purpose, the Committee shall:

- a) review national needs for materials research, development, transfer, and assistance;
- b) assess the effectiveness and adequacy of Federal efforts to meet these national needs;
- c) coordinate and facilitate the planning and implementation of materials-related activities among Federal agencies engaged in materials research;
- d) collect, compile, and disseminate materials information or ensure its availability otherwise in departments, agencies and in the private sector;
- e) make assessments of critical issues in materials where private sector actions are affected by government practices and policy;
- f) encourage joint programs and/or interactions among Federal agencies, laboratories, university, and professional societies; and
- g) prepare reports describing activities, findings, and recommendations.

## Members and Chairperson

The Chairperson of the Committee on Materials shall be appointed by the Chairperson of the FCCSET. The Executive Secretary shall be appointed by the Chairperson of the Committee on Materials. Membership of the Committee on Materials shall be drawn from the subcabinet or other Senior Policy officials who are qualified to address materials issues from those Federal agencies having significant materials research and development activities or materials concerns. Members shall be nominated by their respective agencies subject to approval by FCCSET. In addition, as deemed necessary by the Committee Chairperson and with the concurrence of the members of the Federal Council, or at the request of the Chairperson of the FCCSET, additional members or observers may be appointed to provide specific expertise. The Committee includes representation from:

- Department of State
- Department of Transportation
- Department of Defense
- Department of the Interior
- Department of Agriculture
- Department of Commerce
- Department of Health and Human Services
- Department of Energy
- National Aeronautics and Space Administration
- Environmental Protection Agency
- National Science Foundation
- Federal Emergency Management Agency
- Department of Housing and Urban Development
- General Services Administration

## Administrative Provisions

- a) The Committee will report to the FCCSET through the Chairperson of that body.
- b) Meetings of the Committee shall be called as deemed appropriate by the Committee Chairperson or at the request of the FCCSET. At least two meetings of the full Committee should be held each year to serve as a forum for the identification of problem areas and for the discussion and exchange of relevant program information and for the evaluation of the programs undertaken by the Committee.
- c) Special studies, analyses and recommendations may be initiated by the Committee. As necessary, ad hoc subcommittees or working groups with participation not restricted to Committee members may be formed to assist the Committee in its work.

- d) Staff support shall be obtained in the same manner as specified in Section 3 above. Committee members will assign such working staff as requested by the Committee Chairperson and as is necessary and feasible for the conduct of Committee activities and the achievement of its purpose. The agencies shall pay for direct and incidental costs arising from the participation of their members and staff in Committee activities.

Duration

The Committee will submit a report on its activities annually as indicated above after the first 12 months of its existence. These reports will be reviewed and assessed by the FCCSET.

Compensation

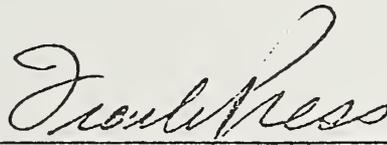
All members will be full-time Federal employees who are allowed reimbursement for travel expenses by their agencies plus per diem for subsistence while serving away from their duty stations in accordance with Standard Government Travel Regulations.

Determination

I hereby determine that the formation of the Committee on Materials is in the public interest in connection with the performance of duties imposed on the Executive Branch by law, and that such duties can best be performed through the advice and counsel of such a group.

Approved:

March 1, 1980  
Date



Frank Press  
Chairman, Federal Coordinating  
Council for Science, Engineering  
and Technology

U.S. DEPT. OF COMM. <b>BIBLIOGRAPHIC DATA SHEET</b> <i>(See instructions)</i>	1. PUBLICATION OR REPORT NO. NBSIR 81-2359 (DoE)	2. Performing Organ. Report No.	3. Publication Date October 20, 1981
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5. AUTHOR(S) Dr. John b. Wachtman			
6. PERFORMING ORGANIZATION <i>(If joint or other than NBS, see instructions)</i> NATIONAL BUREAU OF STANDARDS DEPARTMENT OF COMMERCE WASHINGTON, D.C. 20234 Committee on Materials (COMAT) Chairman, Dr. Edward Frieman, ER-1 Director, Office of Energy Res., DOE		7. Contract/Grant No.  8. Type of Report & Period Covered DOE	
9. SPONSORING ORGANIZATION NAME AND COMPLETE ADDRESS <i>(Street, City, State, ZIP)</i>			
10. SUPPLEMENTARY NOTES This survey updates similar information obtained in a 1976 inventory of materials R & D performed by COMAT.  <input type="checkbox"/> Document, describes a computer program; SF-185, FIPS Software Summary, is attached.			
11. ABSTRACT <i>(A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here)</i> The Survey of Materials Life Cycle Research and Development in the Federal Government - Fiscal Year 1980 was undertaken by the Committee on Materials (COMAT) in response to Congressional expressions of interest that the 1976 Inventory of Federal Materials Research and Development be updated. The 1980 survey includes new information on funding distributions by nature of work (basic or applied research, and developmental), and data on research funding related to critical and strategic materials. The total Federal funding for materials research and development as defined herein has increased from \$961,320,000 in 1976 to \$1,103,683,000 in 1980 (current dollars). The tables of data summarize funding distribution in eight categories and, where data exist, compare distributions with those reported in 1976.			
12. KEY WORDS <i>(Six to twelve entries; alphabetical order; capitalize only proper names; and separate key words by semicolons)</i> COMAT; Federal Government; materials; materials life cycle; research; strategic materials.			
13. AVAILABILITY  <input type="checkbox"/> Unlimited <input checked="" type="checkbox"/> For Official Distribution. Do Not Release to NTIS <input type="checkbox"/> Order From Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.  <input type="checkbox"/> Order From National Technical Information Service (NTIS), Springfield, VA. 22161		14. NO. OF PRINTED PAGES  15. Price	



